

Aquaponic based on Community Development to Increase Villagers' Economy and Reduce Stunting Incidents at Jelbuk Village, Jember

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Abstract

Jelbuk sub-district has 39.30% stunting incidents, which are the highest stunting rate in Jember Regency, Indonesia. Most residents in Jelbuk are farmers who are jobless while waiting the harvest season. Hence, a community-based aquaponic project was created to uplift the community income and reduce stunting incidents in Jelbuk. This paper aims to identify the mechanism of community-based aquaponic project in Jelbuk. This study is qualitative by taking data through interview, observation, and literature review. Aquaponic is the combination of aquaculture and hydroponics where fish and plants grow in one integrated system. Implementing this project requires cooperation among stakeholders, such as healthcare centers, farmer groups, and government. Having the aquaponic system, the community can consume and sell fish and vegetable products to increase their income and reduce the stunting incidents.

Keywords: aquaponic, community, stunting, income.

1. Introduction

In 2016, 22.9% or 154.8 million children aged less than 5 years suffered from stunting, a low height-for-age. Based on the latest data of Monitoring Nutritional Status from the Indonesian Ministry of Health in 2016, Jember Regency had the prevalence of stunting above the national prevalence of 39.2%. In 2017, Jelbuk had the highest stunting rate of 39.30% in Jember Regency.

Most residents in Jelbuk are farmers. They develop farming skill by experience in years. This potential local wisdom is able to be implemented in order for solving stunting problems. The field training data collected by students from Jember University in 2016, the majority of agricultural products in Jelbuk is tobacco and chili. If the harvesting season for the products rises, farmers will get a big profit. However, if they experience crop failure, they will lose much. The income rate in Jelbuk is relatively low because the community depend on the seasonal work to gain income. Thus, they will be jobless when the harvesting season does not come.

Socioeconomic status has an impact on child nutrition. Mothers with low income and education may not afford sufficient food that provides nutritious and diverse diet. Hence, the researchers initiated a community empowerment program in a form of aquaponic system to increase the community income and reduce stunting incidents in Jelbuk. This study aims to give lessons learned by the community in Jelbuk so that they can use the findings in this study to run the project better.

2. Method

This study is descriptive and qualitative by collecting data through interview, observation, and literature review. The study was conducted in Jelbuk village because Jelbuk had the potential to empower the community. Based on a discussion with the local government, the purposive sampling technique uses in one hamlet area in Jelbuk village to become example for other hamlets.

3. Discussion

3.1 The Mechanism of Community Empowerment in Jelbuk

According to Soekanto (1987), empowerment has seven stages as follows:

1. Preparation phase

a. Facilitator Briefing

At the preparation stage, four meetings, such as introductions, planning field studies, identification of perception and what objectives to be achieved by all facilitators, should be carried out. Gathering perceptions of all facilitators can be done through discussion and deliberation using a brainstorming method.

b. Course Preparation

- a) Feasibility of Target Areas
Community Health Development Index (2008) showed that the nutritional status of short and very short babies below 5 years old in Jember Regency is in the fifth rank throughout East Java Province.
- b) Licensing
In this stage, the project needs to get permission from some related parties, such as sub-district chief, village chief, and others who can assist to implement the empowerment project.
- c) Building rapport with informal leaders
A relationship or rapport with informal leaders, such as *Ustadz*, teachers, or other public figures are vital to support the implementation of the empowerment project.
- d) Having contact with community
In this stage, the project should involve the community as a whole by delivering the goals, needs, and potentials that can be developed later.

2. Assessment Phase

a. Identifying problems

Based on the Jember District Health Office, in 2013, Jelbuk has 68.75% short babies which are high percentage. Stunting incidents happen maybe due to lack of nutritional status and bad child bearing.

b. Identifying Resources

a) Residents as Farmers

Most of the residents in Jelbuk gain wages from farming with the farming skills are a great deal of potential since the community can be given a wide selection of vegetables to plant later.

b) Human

The community in Jelbuk have harmonious relationship which can be seen from the mutual cooperation they have built. For example, they hand-in-hand build a house voluntarily.

3. Planning Phase

Aquaponics for catfish and mustard

Aquaponics is a combination of growing fish and vegetables in one place. Herbiwo (2014). Aquaponic setting generally can cultivate plants that require water continuously. Some plants which are potentially cultivated in the aquaponics are mustard, kale, tomatoes, cabbage, and pakchoi Riawan (2016). Aquaponics also cultivates fish, such as tilapia, catfish, carp, *Java barb*, tilapia, carp, and ornamental fish Nugroho (2008). Plants maintained in the aquaponics require less fertilizer as organic substances since fish detritus are brought upside to plant roots. Then, the roots clean the water Riawan (2016). The aquaponics project will be implemented in approximately 6 months with every-two-month harvest season.

Catfish is one of leading commodities that requires freshwater to give enough nutrition. Catfish are easily and affordably cultivated. Catfish contains 15.74% protein. The level of catfish protein is generally higher than that of terrestrial animals that produce higher calories instead.

There are 4 types of aquaponics. One of them is tide system. A tidal system works by pumping a fish pond which will up water to flood to a container where plant roots grow. Using the auto siphon makes water flow back to bottom. Furthermore, the auto chiffon can limit the water level which flow in or back to the container. Plant roots will absorb nutrients during the high tide position and breathe during the low tide position, and this process occurs continuously Riawan (2016).

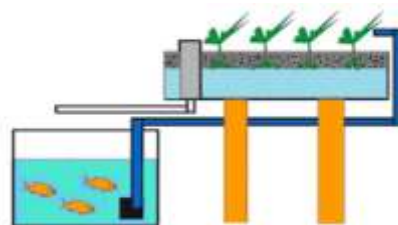


Figure 1 Tidal Aquaponic System

4. Formalization Action Plan

The aquaponics program is a program initiated by students and aims to empower the people in Jelbuk village. This empowerment is assisted by cadres as an extension of students as facilitators and the community. In the first stage, cadres become the pilot of the implementation of aquaponic for the surrounding residents as well as the delivery of information to residents. In the next stage it is assumed that other residents will be more interested in applying the aquaponic. This interest comes from awareness of existing problems and the solutions offered.

5. Implementation Phase

- a. Advocating village
Volunteers and stakeholders in the community advocate village officials and clinics about the project with the aims of improving economic status and nutrition for the community in Jelbuk.
- b. Aquaponic cadres
There are 3 people as aquaponics cadres that can manage logistical goods, recording, monitoring and evaluation, as well as educating community. Youth are prioritized to be the cadres.
- c. Extending an aquaponics system
The target of the counseling is couples of reproductive age (EFA) and who have babies and toddlers. In the extending activities, the facilitators provide materials and demos of aquaponics system that will be implemented in Jelbuk.
- d. Implementing aquaponics
Aquaponics is an alternative to cultivate vegetables and fish in one place. As the community have similar potentials as the skills needed in aquaponics, this project is easier to accomplish. In spite of increasing the community income, this project aims to improve the nutritional status of the community.

6. Evaluation Phase

Evaluation takes place four aquaponics harvest seasons.

- a. Harvest I, the first harvest needs to be evaluated twice in a month to monitor the aquaponics.
- b. Harvest II, the second harvest is evaluated once to monitor whether there is a threat or any other factors that hamper the aquaponics system.
- c. Harvest III, the third harvest is only evaluated once.

7. Termination Phase

At this stage, the volunteers meet to determine the sustainability of the project. In the meeting, volunteers learn how to maintain contact with the community, especially the cadres, and ensure that the program is run properly. Monitoring on the aquaponics system is done twice in 4 months to ensure the project works properly without the help of facilitators.

3.2 Aquaponics as an Alternative to Reduce Stunting and Increase Economic Status

3.2.1 The Ability of Aquaponic to Reduce Stunting Prevalence

A. Accessible Food

Aquaponics can be built in a yard with narrow space. Establishing aquaponics in house-setting area will expose the community to more accessible food. Hence, it is expected to help the fulfillment of nutrients for them. Aquaponics produces vegetables and fish easily with cheap prices. Aquaponics system is easy for those who are not used to carry out DIY (Do It Yourself) project Powell (2013). Aquaponics project tends to be easy because it does not require special expertise with easy-to-get materials.

B. Accessible Nutrient Resource for Family

The aquaponic system in Jelbuk village is built a pair in every house in order the harvest season can be done continuously. Space is needed around 1 m³ for 150 catfishes in a pool. 150 fishes and mustard seeds are sown on the first month, then the second pool is sown 150 fishes and mustard seeds in the second month. Within 2 months the catfish and the mustard can be harvested, so the first pool is ready to be harvested in the second month, and the second pool can be harvested in the third month. The system is made to fulfill a family's food needs per month.

By spreading 150 fishes, the harvest estimation is around 16,8 kg (Hendriana, 2012). According to the Directorate of Community Nutrition and Research and Development of the Ministry of Health of the Republic of Indonesia (1991), every 100 grams of catfish contains 17 grams of protein, 4.5 grams of fat, 76 grams of water, 0 grams of carbohydrates, 20 milligrams of calcium, 200 milligrams of phosphorus, 1 milligrams of iron, 150 milligrams of Vitamin A, and 0,05 grams of Vitamin B. Nutrition Adequacy Rate (RDA) for protein is based on the Minister of Health Regulation Number 75 of 2013 which are for 7-11 months of age is 18 grams, 1-3 years is 26 grams, and 4-6 years is 35 grams. For children, a serving is 1 ounces at age 2 and increase with age 2 for ounces by age 11. It 2 to 3 servings a week Food and Drug Administration (2019). So protein that provided by catfish in a month is 400 grams approximately for a child under five years old. Therefore, proteins from catfish that produces by aquaponic system can supply child under five years old's proteins need in the family.

3.2.2 Increasing Economic Status with Aquaponics

Professional Aquaponic management can improve the quantity and quality of aquaponics products. Well-managed aquaponics products can give the community additional earning. The price of fish and vegetables as the aquaponics

products will get increasing if the community know the benefits of aquaponics for them Greenfeld (2019). If aquaponic products are managed well in an integrated system, the market scope can be larger.

4. Conclusions

The community-based aquaponics system to empower the community in Jelbuk requires cooperation among various parties. Community willingness and participation are key to success in the project implementation. Government support is absolutely necessary for the success of the project. The aquaponics system is able to be implemented to increase rural economic status and health status which can be measured from the number of stunting incidents in Jelbuk. The primary limitation to the generalization of these results is the number of samples on the population. Community development by approaching one hamlet as the first role model might not be received well in some societies.

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